UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,513	03/10/2004	Brian S. Higgins	7340-011	4226

4678 7590 07/18/2007

MACCORD MASON PLLC
300 N. GREENE STREET, SUITE 1600
P. O. BOX 2974
GREENSBORO, NC 27402

EXAMINER	
COCKS, JOSIAH C	

ART UNIT	PAPER NUMBER
3749	

MAIL DATE	DELIVERY MODE
07/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,513	HIGGINS, BRIAN S.	
	Examiner	Art Unit	
	Josiah Cocks	3749	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 17-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 17-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 17, 2007 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1-3** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 4,029,752 to Cahn** ("Cahn").

Salooja discloses in the specification and figures 1-10 an invention in the same field of endeavor as applicant's invention and similar to that described in applicant's claims 1-3.

In particular, in regard to at least claim 1, Salooja discloses a method of reducing the acidity (each of nitrogen oxides and sulfur trioxides, see cols. 5-7) comprising the steps of:

a) partially combusting the fuel in a first stage to create a reducing environment (see at least col. 1, lines 50-54);

b) maintaining the reducing environment for a sufficient time period such that reducible acids are reduced to a predetermined level to achieve a desirable acidity concentration in the flue gas (see at least col. 1, lines 54-59 and cols. 5-7 describing that the nitrogen oxides and sulfur tri-oxides are controlled to desired/predetermined levels);

c) combusting the remainder of the fuel and combustion intermediates in a second stage with oxidizing environment; thereby decreased the acidity of the flue gas by reducing the acid concentration of the gas (see at least col. 1, lines 60-63 and lines 29-33).

In regard to the limitation the reducible acids are reduced "by electron addition", while Salooja does disclose that the nitrogen oxides and sulfur trioxides are reduced, the reference does not appear to go into further detail as to the mechanisms of the reduction, namely "by electron addition".

Cahn teaches a method of reducing sulfur oxides that is considered to be in the same field of endeavor as both applicant's invention and Salooja. Chan describes that sulfur oxides in a process gas stream are reduced by reaction with ammonia (i.e. NH3) as a reducing agent (see at least col. 7, lines 48-52). Chan clearly provides that sulfur trioxide is reduced in the same manner as the described processes for sulfur dioxide (see at least col. 7, lines 34-38). The examiner notes that at least ammonia (NH3) is considered to be the type of reducing radical described in applicant's specification (see specification p. 9, line 14 lists NHi). Further, the examiner also notes that Chan also suggests that other reducing agents such as H2, CO, and CH4 (also listed in applicant's specification) are recognized in the art as reducing radicals creating a

reducing environment (see Chan, col. 7, lines 65-68). This describes process of employing either ammonia or other above noted agent to result in the reduction of sulfur trioxide (a reducible acid) is considered to suggest the reduction by election addition described in applicant's specification and claimed in claim 1.

Returning to Salooja, while this reference provides only some detail of the reducing of sulfur trioxides through the practice of the described method, there is clear suggestion that the reduction of sulfur trioxides is recognized in the art. Accordingly, a person of ordinary skill in the art at the time the invention was made would desirably modify the process in Salooja to incorporate the reduction by electron addition suggested by Cahn to desirably produce a gas stream that has "little or no" sulfur trioxide (see at least Cahn, col. 8, lines 41-46).

In regard to at least claim 2 and 3, Salooja describes that a catalytic burner is supplied at least in the first stage that produces lower NOx production than conventional combustion systems (see at least col. 6, line 67 through col. 7, line 4 and col. 4, lines 31-47) and thus reasonably suggests micro-staging through the use of low-NOx burners.

4. **Claims 4-7 and alternatively claims 2-3** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 4,029,752 to Cahn** ("Cahn") and further in view of applicant's admitted prior art.

In further regard to claims 2 and 3, the examiner notes that applicant admits that the use of micro-staging using low-NOx burners to reduce emissions in combustion furnaces is known in the art (see admitted prior art of page 5, lines 4-18 of applications' specification). Accordingly, even if the operation of the catalytic burners of Salooja are not properly considered to be

applicant's recited micro-staging using low NOx burners, a person of ordinary skill in the art would desirably seek to incorporate mircro-staging using low NOx burners in the process of Salooja in order to desirably aid in reducing NOx emissions (see admitted prior art of p. 5, lines 4-18 of applications' specification).

In regard to at least claims 4-7, applicant also admits that the use of macro-staging using over-fired air and used in combination with micro-staging using low NOx burners is known in the art (see admitted prior art of page 5, line 19 through page 6, line 5 of applications' specification). Accordingly, a person of ordinary skill in the art would seek to employ macro-staging using over-fired air in a combustion stage and/or in combination of micro-staging using low NOx burners to desirably achieve NOx emissions reduction (see admitted prior art of page 5, line 19 through page 6, line 5 of applications' specification).

5. **Claims 4-8 and alternatively claims 2-3** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 4,029,752 to Cahn** ("Cahn") and further in view of **U.S. Patent No. 4,824,441 to Kindig** (Kindig") (previously cited).

Salooja in view of Cahn teach substantially all the limitations of applicant's claims 2-8 (see discussion of these references above) with the possibly exception of macro-staging the first stage fuel combustion through over-fired air and the use of coal as a fuel.

In regard to claims 2 and 3, as noted above, the operation of the catalytic burners disclosed in Salooja and/or applicant's admitted prior art are considered to suggest the low-NOx burners of applicant's claims 2 and 3. However, Kindig is cited to provide further evidence that

the use of low NOx burners is well understood in the art to desirably control the combustion reaction (see Kindig, col. 10, lines 27-32). Kindig describes a method for the reduction of sulfur oxides and nitrogen oxides in a combustion process that is analogous art to applicant's invention.

In regard to at least claims 4-7, Kindig also cited to show that it is well understood in the art to control combustion zone temperature by controlling the amount of oxygen feed to combustion zones (see col. 10, lines 43-47). This is considered to suggest macro-staging through the use of over-fired air as recited. Further, Kindig suggests that such macro-staging is used in combination with micro-staging using low NOx burners as recited in order to desirably controlling emission of nitrogen oxides (see col. 10, lines 43-54).

In regard to at least claim 8, each of Salooja and Cahn suggest that sulfur oxides and nitrogen oxides reduction in combustion processes is desirable when burning liquid and gaseous fuels (see Salooja, col. 1, lines 22-24 and Cahn, col. 4, lines 49-54). However, these references to not expressly mention coal as the fuel. However, Kindig clearly provides that the burning of fossil fuels, including coal, produce undesirable sulfur oxides and nitrogen oxides emissions (see Kindig, col. 1, lines 16-21). Accordingly, a person of ordinary skill in the art would reasonably understand that the combustion process of Salooja in view of Cahn would be applied to the burning of coal as a fuel source, as taught in Kindig, in order to reduce the undesirable emissions recognized to be produced by the burning of coal.

6. **Claims 17-23 and 25-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 4,029,752 to**

Cahn ("Cahn"), and applicant's admitted prior art, and further in view of **U.S. Patent No. 4,196,057 to May** ("May") (previously cited).

Salooja, Cahn, and applicant's admitted prior art teach substantially all of the limitations of the methods recited in claims 17-23 and 25-31 (note the discussion of the teachings of the prior art above) with the possible exception of the steps of measuring acid dewpoint and adjusting the reducing environment to lower the flue acid gas dewpoint.

In regard to claim 17, the acid of concentration of the flue gas is directly related to the acid dew point temperature of the flue gas. This is expressly noted by applicant in applicant's description of the prior art, namely "...as the SO3 concentration increases, the acid dew point temperature of the flue gas increases." (see applicant's specification, p. 1, lines 16-18). To further support this assertion the examiner also points to May. May discloses a method which provides that "[m]easurement of dew point enables a semi-quantitative determination of the sulfur trioxide concentration in the exhaust or flue gas" (see May, col. 5, lines 30-32 and 38-42). Accordingly, a person of ordinary skill in the art would understand that reduction of the acid concentration of the flue gas necessarily results in the lowering of the acid dew point level of the flue gas. As noted above, Salooja provides for the reduction of sulfur oxides from the effluent of flue gas of a furnace to a desired level (see at least col. 1, lines 54-59 and cols. 5-7). Therefore, a person of ordinary skill in the art would reasonably understand that obtaining the reduction target of the oxides in the flue gas as specified in Salooja would necessarily result in a corresponding desired dew point level (again see at least May, col. 5, lines 38-42).

In regard to claims 18-23, these limitations correspond to those of claims 2-7 and have been identified in the prior art as noted above.

In regard to claim 25, this claim includes limitations similar to that of claim 17 with the additional method step of "measuring the acid dewpoint of the flue gas." Salooja possibly does not expressly disclose actively measuring the acid dewpoint of the flue gas.

However, May, as previously noted, clearly provides that the dew point of the exhaust gas is measured to determine a concentration of sulfur trioxide (see May, col. 5, lines 30-32). Further, May provides that the measurement of the dew point also allows for determination of "cold end" corrosion locations (May, col. 5, lines 32-34) and further that the inherent corrosion rate measurement that arises form the dewpoint measurement "indicates the degree of inhibition of an additive such as magnesium and the actual condition at the surface." (May, col. 5, lines 34-37).

Accordingly, a person of ordinary skill in the art would desirably modify the method of Salooja to incorporate measuring the acid dewpoint of the flue gas as taught in May to determine the level of corrosion that results from the additives in the flue gas (see May, col. 5, lines 30-37).

In regard to claims 26-31, these limitations correspond to those of claims 2-7 and have been identified in the prior art as noted above.

7. **Claims 17-32** are rejected under 35 U.S.C. 103(a) as being unpatentable over **U.S. Patent No. 4,375,949 to Salooja** ("Salooja") in view of **U.S. Patent No. 4,029,752 to Cahn** ("Cahn"), and **U.S. Patent No. 4,824,441 to Kindig** (Kindig") (previously cited) and further in view of **U.S. Patent No. 4,196,057 to May** ("May") (previously cited).

Salooja, Cahn, and applicant's admitted prior art teach substantially all of the limitations of the methods recited in claims 17-23 and 25-31 (note the discussion of the teachings of the

prior art above) with the possible exception of the steps of measuring acid dewpoint and adjusting the reducing environment to lower the flue acid gas dewpoint.

In regard to claim 17, the acid of concentration of the flue gas is directly related to the acid dew point temperature of the flue gas. This is expressly noted by applicant in applicant's description of the prior art, namely "...as the SO3 concentration increases, the acid dew point temperature of the flue gas increases" (see applicant's specification, p. 1, lines 16-18). To further support this assertion the examiner also points to May. May discloses a method which provides that "[m]easurement of dew point enables a semi-quantitative determination of the sulfur trioxide concentration in the exhaust or flue gas" (see May, col. 5, lines 30-32 and 38-42). Accordingly, a person of ordinary skill in the art would understand that reduction of the acid concentration of the flue gas necessarily results in the lowering of the acid dew point level of the flue gas. As noted above, Salooja provides for the reduction of sulfur oxides from the effluent of flue gas of a furnace to a desired level (see at least col. 1, lines 54-59 and cols. 5-7). Therefore, a person of ordinary skill in the art would reasonably understand that obtaining the reduction target of the oxides in the flue gas as specified in Salooja would necessarily result in a corresponding desired dew point level (again see at least May, col. 5, lines 38-42).

In regard to claims 18-24, these limitations correspond to those of claims 2-8 and have been identified in the prior art as noted above.

In regard to claim 25, this claim includes limitations similar to that of claim 17 with the additional method step of "measuring the acid dewpoint of the flue gas." Salooja possibly does not expressly disclose actively measuring the acid dewpoint of the flue gas.

However, May, as previously noted, clearly provides that the dew point of the exhaust gas is measured to determine a concentration of sulfur trioxide (see May, col. 5, lines 30-32). Further, May provides that the measurement of the dew point also allows for determination of "cold end" corrosion locations (May, col. 5, lines 32-34) and further that the inherent corrosion rate measurement that arises form the dewpoint measurement "indicates the degree of inhibition of an additive such as magnesium and the actual condition at the surface." (May, col. 5, lines 34-37).

Accordingly, a person of ordinary skill in the art would desirably modify the method of Salooja to incorporate measuring the acid dewpoint of the flue gas as taught in May to determine the level of corrosion that results from the additives in the flue gas (see May, col. 5, lines 30-37).

In regard to claims 26-32, these limitations correspond to those of claims 2-8 and have been identified in the prior art as noted above.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re*

Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. **Claims 1-8 and 17-32** are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-25 of copending Application No. 10/798,088.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims 1-8 and 17-32 of this application are broader in scope but claiming the same invention as that of claims 1-25 of Application No. 10/798,088.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

10. Applicant's arguments with respect to claims 1-8 and 17-32 have been carefully considered but are moot in view of the new ground(s) of rejection on the basis of Salooja and Cahn as described above.

Conclusion

11. This action is made non-final. A THREE (3) MONTH shortened statutory period for reply has been set. Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Josiah Cocks whose telephone number is (571) 272-4874. The examiner can normally be reached on M-F 8:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven McAllister, can be reached (571) 272-6785. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jcc
July 12, 2007

JOSIAH COCKS
PRIMARY EXAMINER
ART UNIT 3749